Incorporating "The Illuminating Engineer."

Light and Lighting

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The 1,000 Mark

THE Illuminating Engineering Society is Getting On. It has doubled its membership during the last few years. It has now over 800 members of all classes, and is looking forward to soon reaching the 1,000 mark.

No doubt a Society can do excellent work with quite a few members. But there is no getting away from the fact that once the membership gets past the 1,000 mark a Society is regarded differently. It enjoys enhanced prestige. Numbers form an indication of interest excited. They show that a subject has a following.

There is no reason whatever why the 1,000 mark should not be reached quite soon. The Society has plenty to offer its members—the Journal and the Transactions; Sectional, General and Local Meetings, numbering about 50 a year; a common interest in a live subject; a unique platform where those connected with rival systems can meet on a friendly footing; the prospect of professional status, for those who desire it, in the near future.

A Good Return.

Another Year's Progress

The report of the Council of the Illuminating Engineering Society for the past session, presented at the annual meeting on May 10, showed that the substantial progress of recent years has been maintained, indeed intensified. The outstanding feature has been the success of the special sections—remarkable because all have succeeded in attracting good audiences, notwithstanding the great increase in the number of meetings held in London. Equally striking has been the progress of the newly formed local centre for the North Midland Area which, in its first year of existence, has brought its membership up to approximately 100. This example should serve as an inspiration both to the older established centres and to the fifth centre just started in Birmingham which enters on its career with good prospects. Very fortunately, too, this increase in activity has been accompanied by a corresponding increase in the income of the Society, so that no undue strain has been put on its resources. The Papers Committee and the various committees for the special sections and local centres are now preparing for the next season. Any members who have papers to offer or ideas which might be embodied in the next session's programmes should get in touch with the secretary concerned.

Lighting Developments in Belgium

Following the annual meeting the Society was favoured by an address by Mr. E. Uytborck on lighting developments in Belgium. In that country a high stage of electrification has evidently been reached. It is estimated that over 99 per cent. of the population are consumers of electricity, which has been widely applied to public lighting during recent years. Mr. Uytborck gave an interesting description, illustrated by lantern slides of the lighting of some of the chief streets and buildings in Brussels and Antwerp. A feature in Brussels is the wide tree-lined boulevards, many of them with multiple tracks for motor traffic, whilst in Antwerp the method of lighting, by sodium lamps, of the tunnels under the Scheldt is of interest. Sodium lighting is evidently very widely used, though in Brussels experiments with "mixed" tungsten and h.p. mercury vapour lamps are now being made. Extensions in the lighting of national roads connecting cities, involving the expenditure of upwards of £125,000 per annum, are now being planned. The final portion of Mr. Uytborck's address dealt with education and "propaganda" in favour of better lighting. One was rather glad to find a speaker definitely pressing the case for "propaganda." People are apt to look askance at the term—yet, in its best sense, it implies only the sharing with others of knowledge one has oneself acquired—surely a laudable intention!

"Mixed Lighting"

The multiplicity of sources of light now available seems to favour the use of mixed installations, enabling the benefits of different types of lamps to be gained simultaneously. There are good opportunities for the combination of discharge tubes and filament lamps in signs and spectacular lightings. The most usual form of "mixed lighting" for some time to come may be the combination of the new high pressure mercury discharge lamps with tungsten filaments. A good example is furnished at Cronulla, one of the most popular beaches on the New South Wales Coast, where the so-called "white way" system is being installed on coastal roads. Forty-three standards, on which 125 watt mercury lamps are combined with tungsten filament lamps, have already been installed and the number may soon be increased to 130. According to the *New Zealand Electric Journal* those present at the official inauguration of the system were much impressed and the installation is considered to rank among the best of its kind in the world.

X-Ray Testing Outfits

It would seem that X-Rays, as a means of detecting flaws and hidden defects in metal, are at length proving their value in practice. It is stated that they are now being seriously applied in the United States for testing the quality of welds and are also being used by boiler manufacturers and others to examine the quality of costly castings. In principle this is an important step. Such tests offer a means of examining quality without the destruction of material—hitherto the great drawback of so many tests used in engineering practice.

Luminescent Materials and their Application to Light Sources

A summary of a paper read before the Illuminating Engineering Society on April 12th, by Mr. J. W. Ryde.

Not so long ago most luminescent effects, whilst providing fascinating lecture experiments, had little practical application. Lately, however, the luminescence of gases and vapours has been utilised on a large scale in the form of discharge lamps. The colour of the light has been restricted to a few types (the "mercury light," "neon light," "sodium light," etc.). The field for such lamps would be much extended if the colour could be completely controlled. Also the luminous efficiency, though, high, is still far below that theoretically possible, much radiation being emitted in an invisible form. If part of the latter could be converted into visible light, the efficiency would be raised considerably.

This field of research marks a second stage in the development of discharge lamps, a feature of which is the utilisation of photo-luminescence of *solids*.

In the next section of his paper Mr. Ryde briefly sketched the history of luminescence, and illustrated its appearance in various forms (chemico-luminescence, bio-luminescence, etc.), pointing out the distinction between fluorescence and phosphorescence (the latter term being used when the effect persists after the excitation is no longer applied). Mention was made of such early materials as Bologna stone, Canton's phosphorus, etc., and of the pioneering research work of Becquerel and Stokes, the latter of whom framed the familiar law—that the wavelength of the emitted light is always greater than that of the exciting radiation. To this there are apparent exceptions (as exemplified in the behaviour of certain fluorescent organic compounds and solid phosphorus). Such variations, however, are small.

Mr. Ryde recalled the firefly, often referred to as the most efficient source of light credited with an efficiency, based on the energy distribution, of 200 lumens per watt. If, however, account is taken of the heat evolved in the oxidation of luciferin it is seen that the overall efficiency is not nearly so high —being, in fact, between 1 and 10 lumens per watt.

Mr. Ryde also illustrated, by numerous striking experiments, the photo-luminescence of different solids, such as organic materials (anthracene, etc.), pure inorganic compounds, and "activated" inorganic solids. The properties of the latter are greatly affected by the presence of a small quantity of copper, bismuth, or manganese, and other substances, the fluorescence being intensified or the colour modified. There are likewise materials which act as "inhibitors" and have the opposite effect. Great care has sometimes to be taken to prevent the presence of even a minute proportion—as little as one part in a million—of such substances. In the case of zinc and cadmium sulphides one or two parts of nickel per million appreciably reduces phosphoresence, and thus inhibits the "after-glow" without appreciably affecting fluorescence—an effect which has been exploited in the production of screens for X-ray work.

The applications of photo-luminescent materials to electric discharge lamps have been discussed in a number of recent papers. Energy applied to such sources reappears as (a) ultra-violet radiation, (b) visible radiation, (c) near infra-red radiation, and (d) thermal losses, including very long wave infra-red radiation. Stokes's Law indicates that luminescent materials cannot be of service in reducing (c) or (d), but they can be of value in transforming the wasted energy (a). In mercury discharge lamps operating at about one atmosphere the thermal loses (d) account for some 60 per cent. of the energy supplied, 12 per cent. appears as visible light, and an equal quantity as near infra-red radiation, and about 15-20 per cent. as ultra-violet radiation. There are thus evident possibilities in applying photo-luminescent materials to mercury lamps. Valuable effects can also be gained in neon discharge lamps. With sodium lamps, however, about 14 per cent. of the energy supplied is radiated as visible light, and the remaining 86 per cent. appears as infra-red and thermal losses, so that practically nothing can be done in this way.

The sensitive materials may be (I.) placed on reflectors surrounding the source of light, (II.) on the inside of an outer glass bulb surrounding the discharge tube proper, or (III.) on the inner wall of the actual tube through which the discharge passes. Organic materials are in general only applicable when method (I.) is used.

It is necessary in selecting materials to ensure that (a) the fluorescent colour is appropriate, (b) the fluorescence efficiency as high as possible, and (c) the fading effect reduced to a minimum. Experience with such dyes as rhodamine, and the efforts made to diminish fading, were described by the author. In view of the latter difficulty the author proposed the use of cadmium sulphide phosphors, applied to transparent envelopes surrounding the lamp, according to method (II.). Lamps utilising this device appeared last year. They operate at 37-38 L/W with 5-6 per cent. of red.

In the case of low pressure and neon discharge tubes, method (III.) may be used. Although neon emits little ultra-violet light in the range of wavelengths transmitted by glass, it radiates strongly in the far ultra-violet. H. G. Jenkins found in 1935 that zinc orthosilicate and calcium tungstate compounds can be strongly excited by the pure neon discharge. The brightness of neon excited tubes remains almost the same after 3,000-4,000 hours' burning. The author demonstrated the remarkable range of colours obtainable by using fluorescent coatings, presented in the accompanying table. Glasses that are themselves fluorescent may also be used, but it is not thus possible to convert so large a range of wavelengths into visible light.

Gas or vapour filling	Luminous Powder used	Resultant colour	Luminous efficiency of tube in lumens per watt Average values
Mercury	None	Pale blue	5
	Zinc orthosilicate	Bright green	50-60
	Zinc meso-disilicate	Yellowish white	25
	Zinc - beryllium silicates (various)	Pink to cream white	30-40
	Calcium tungstate	Deep blue	15
	Magnesium tungstate	Light blue	30
High efficiency neon	None	Orange red	15
	Zinc orthosilicate	Yellow	22
	Calcium tungstate	Pink	15

Development in this field is still proceeding. In the case of zinc orthosilicate, an efficiency as high as 100 lumens per watt has actually been reached, though one must be content with lower efficiencies if due regard is paid to the colour of the light. Tubes are, however, under development which give excellent colour at efficiencies between 30 and 40 L/W.

The Light Requirements of Runway Marker Lights for Aerodromes

By W. M. HAMPTON, Ph.D., B.Sc., F.Inst.P.

A runway marker light is used to denote a track on an aerodrome along which an aeroplane may land safely. Its chief use is in bad weather at night when ordinary objects are invisible. An attempt has therefore been made to decide on the polar distribution required for such lights on the basis of certain assumptions. These are:—

1. A uniformly absorbing atmosphere.
2. An illumination at the observer's eye to give adequate conspicuity.
3. Known heights of the observer above the ground.
4. A necessity for always seeing three lights at 50 ft. spacing in addition to the one vertically below the machine.

It is also noted that intensities below 1 candle and much above 100 candles are impracticable in view of the lamps available, and, in view of (4) above, ranges vary from, say, 10 ft. to not more than about 300 ft.

(1) The Effect of Atmospheric Absorption.

The accepted formula relating the range to the intensity is:—

$$I = \frac{E\,x^2}{t^x} \qquad \ldots\ldots(1)$$

where

I = intensity in candles
E = limiting illumination at the eye = 0.5 mile candles
x = distance in miles.
t = relative transmission at unit distance (1 mile).

Fig. 1 gives these curves for various values of t and the curve passing through the rectangle corresponding with I = 1, I = 100, x = 100, x = 250 is taken as representing the worst weather for which a design is practicable. For, if the weather be worse, excessively high intensities are needed, and if better, impracticably low intensities are called for to comply with equation (1), and the values deduced for the higher absorption merely mean more than adequate conspicuity in weather which is clearer.

Thus, the value of t which is used in the following is $10^{-1\cdot25}$, or log. t = −125. This corresponds to a transmission of 1% at 85 ft. It is of interest to note that for log. t = −125.

10 ft.	requires	...	2.8×10^{-6} candles.
100 ,,	,,	...	4.5×10^{-2} ,,
1000 ,,	,,	...	10^{22} ,,

(2) The Distribution Required.

See Figure 2.

	y = 10	50	100	150	200 ft.
OA = $\sqrt{150^2 + y^2}$	150	158	180	212	250
OB = $\sqrt{100^2 + y^2}$	100	112	141	180	224
OC = $\sqrt{50^2 + y^2}$	51	71	112	158	206
OD = y	10	50	100	150	200

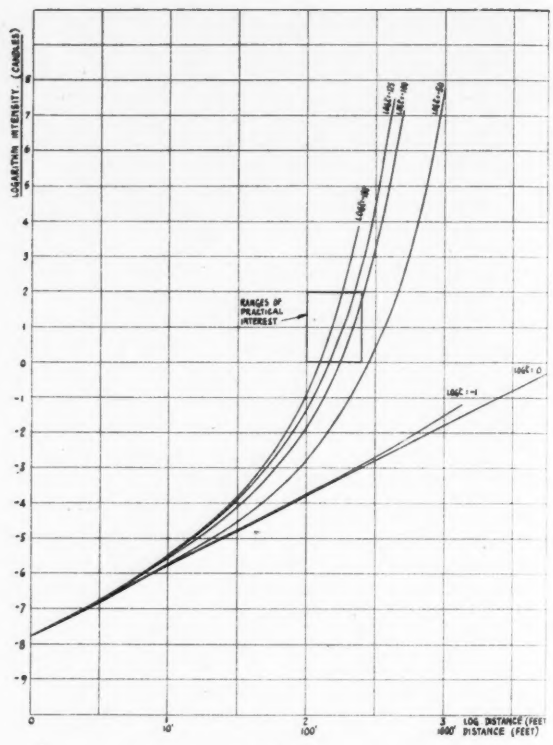


Fig. 1.

The corresponding angles above the horizontal are:

	y = 10	50	100	150	200 ft.
OAD	3.8°	18.4°	33.7°	45.0°	53.1°
OBD	5.7°	26.6°	45.0°	56.3°	63.5°
OCD	11.3°	45.0°	63.5°	71.6°	76.0°
ODA	90°	90°	90°	90°	90°

Then from the distances OA, OB, etc., the required intensities can be found from Fig. 1 for any value of t. These can be plotted against the angle, as in Fig. 3 for the case log. t= −125.

In this diagram, the lines sloping downwards to the right, represent the intensity as a function of the angle of view for various heights of the observer. Thus, at the 10-ft. height, an intensity given by log. I= −5.7 is required from the marker light which is vertically below, the beam in this case being sent vertically upwards, while from a marker light

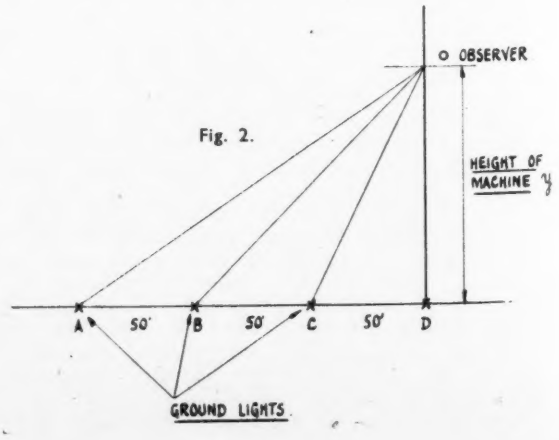


Fig. 2.

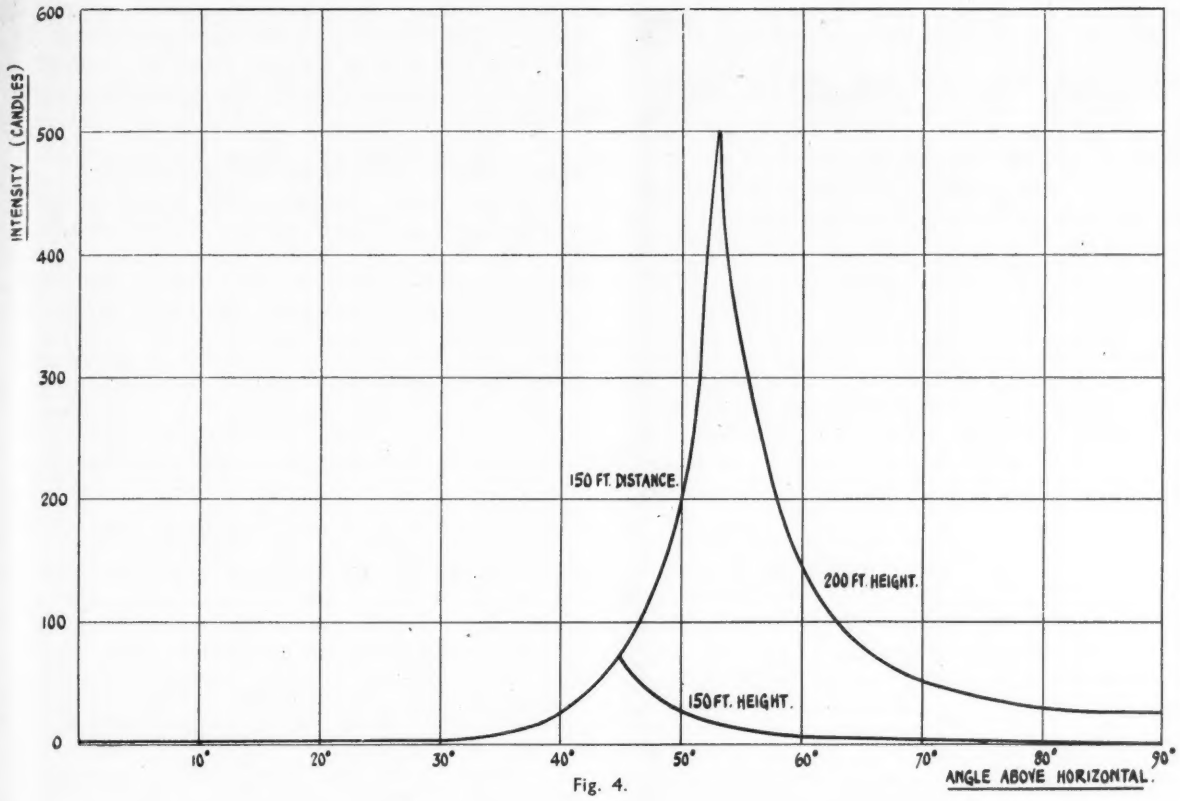


Fig. 4.

in a direction of 10° to the horizontal a value of I given by log. I= −2.8 is required.

Points can then be deduced corresponding to the angles made at 50, 100, 150 ft., etc., from the point vertically below the machine, and the lines sloping upwards to the right are given by joining such points.

Again, considering the practicable range of intensity as log. I = O to log. I = 2, and that the maximum distance along the horizontal is 150 ft. in accordance with assumption 4, the line joining the 150 ft. points gives the intensity curve required.

However, as machines are unlikely to be more than 200 ft. up over an aerodrome on which they are about to land, it is permissible to follow the 200 ft. height of machine right up to the point of intersection.

The final curve is therefore taken as that shown in heavy dots in Fig. 3, and this is replotted as a distribution curve on a linear scale in Fig. 6. A similar curve is shown for a maximum height of 150 ft.

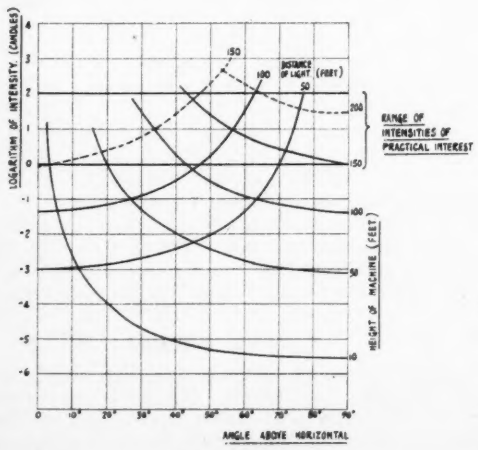


Fig. 3.

(3) Wattage Required.

The wattage required depends on the maximum height which is catered for, but the polar curve at the lower angles is independent of the height.

The flux required is (for white light):

200 ft. max. height, 295 lumens. At 50% efficiency=60 watts
150 ft. „ „ , 80 „ . 50% „ 20 „

The final polar curve is widely different from that given by any runway marker light available, calling for very small intensities at low angles, i.e., below 30° above the horizontal, then rising rapidly to a peak at 53°, and falling more slowly to the zenith, where 40 candles are needed.

The controlling factor in deciding the peak intensity is the height of the machine, a reduction from 200 ft. to 150 ft., reducing the peak from over 1,000 to about 70, and the angle at which the peak occurs from 53° to 45°, and the lumen content of the beam from 530 to 75, with a corresponding reduction in the wattage of the lamp.

The Case for Compulsory Wiring Regulations and Registration

The activities of the A.S.E.E. with regard to the introduction of compulsory wiring regulations and registration have reached a further stage. Their proposals have been put before different audiences professionally interested in the matter, and we gather that, in general, the reception has been quite favourable. The formation of a committee, comprising representatives from organisations concerned in the electrical industry and authorities concerned, is now being considered. It may be recalled that the scheme at present deals with three main points—the imposing of regulations with regard to the erection of wiring installations, the compulsory registration of electrical contractors and operatives, and, thirdly, the compulsory approval of installation material, accessories, and apparatus.

How I would Plan the Lighting of a Home

In what follows we present a summary of the address given by Miss Edna Moseley at the meeting of the Decorative Lighting Section of the Illuminating Engineering Society, held at Gas Industry House, (Westminster), on March 22nd.

In approaching this subject the first question is that raised at a recent meeting of this section, "What is Decorative Lighting?" The term may refer to a form of decoration produced by the use of light, but purely for effect as is found in exterior lighting—for example in Piccadilly or at the Paris Exhibition Or it may imply that the decor of an apartment, building or street is improved or enhanced by incorporating the sources of artificial light into the scheme of general decoration. This second definition seems to cover better what is generally thought of as decorative lighting in the home. How far is it desirable to carry conscious effect, with light or other decorative medium, into the decoration of rooms used every day?

Incorporating sources of light in the scheme of decoration becomes at once a structural as well as a decorative lighting problem. An ordinary rectangular room with a flat ceiling is no basis for lighting effects. Some structural provision must be made to conceal sources. Another limitation is the distance of the source from the surface illuminated. To get even distribution of light through a glass panel the lamps must be some distance behind the glass, which means structurally a greater depth than would normally be found in the thickness of a wall or between floor and ceiling. Hence either the pane must project into the room or an excrescence or lump will be necessary in the adjoining room. If expense is not considered there is no reason why such things should not be done. But in general the subject of lighting must be considered along with the construction of the rooms. Therein lies the great danger, in domestic work, of getting too dominant and too permanent a result. It would only be in special rooms, or in those used intermittently for special purposes, that any form of decoration that was highly exciting or distracting should be introduced. The greatest consideration of all in domestic lighting is suitability for the purpose.

Various Types of Homes.

The number of houses where studied and designed effects worthy of the name are suitable, and where cost of installation and maintenance count for little, is very small indeed—except in Filmland. It is, therefore, a special problem comparable rather to hotel and restaurant lighting.

In the purely domestic field there are many different types of homes to be considered—new houses, old houses, old houses altered and adapted, flats, prefabricated houses, etc. Each type must be dealt with separately, but in general cost has a great deal to do with the decision. The utilitarian aspect of lighting is of paramount importance. It would be useless to pretend that in the cheapest flats and houses decorative lighting can play any real part. This is a good thing. The lighting of these simplest types of residences should be as unobtrusive as possible.

When we come to houses where more money can be spent on finishing and decorations the aspect of the problem is changed. Widely different methods direct and indirect, semi-direct and semi-indirect can be brought into play. But even so it is suggested that in all living rooms or sitting rooms, where the tired business man or woman wants to relax after their efforts, no very dominant decorative feature should be introduced.

Simple Effects in Living Rooms.

At a recent lecture which the author attended some extremely interesting and decorative effects achieved by the movement of different coloured lights over a draped hanging were shown. The result was quite charming, but purely "entertainment" and unsuitable for use in the habitable rooms of a home. Many of you have doubtless a spouse who insists on listening to a wireless play whilst you want to read. Can you imagine what would become of your nerves if your son or daughter insisted on "switching on" the decorative lighting at the same time? In living rooms, nevertheless, some very simple scheme might be admissible—such as lighting a vase of flowers or a precious piece of china by concealed or flood lighting, always so long as the general lighting of the room can be used separately. In such rooms the use of coloured lights and the effect of light on coloured surfaces might well receive attention. Coloured lighting, however, is a tricky business and difficult to use successfully. A room bathed in light of a certain colour may be distressing whereas, if that coloured light was reflected on to the ceiling the eye itself might make the contrast necessary to a harmonious result.

On the other hand decorative features which would be irritating in the sitting room might be stimulating in the dinng room—though, if the decoration were really smart and clever a breakfast room might be needed as well. Even in quite small and simple dining rooms effects can be achieved by the use of lighting on curtains from the pelmet box, by making a focal point of some feature and lighting it and so on.

Treatment of Various Rooms.

Staircases and halls offer greater scope for deliberately designed decorative lighting. The shapes formed by the rise of the stairs give an opportunity of combining the useful with the decorative. First impressions are important. Therefore a slightly dramatic effect in the entrance hall awakens interest in the house visited.

Bathrooms, being used intermittently, offer opportunities. Amusing schemes, in which lighting plays a part, may be devised.

Bedrooms are surely rooms in which restfulness and simplicity should be the keynote. There seems to be a "film star" quality about all ornamented bedrooms. The lighting must, above all, be efficiently arranged for the several uses to which it is put. The general lighting of the room and the lighting at the bed, dressing table, and mirror have to be co-ordinated if they cannot be combined.

The same requirements of simple and efficient but unobtrusive lighting are met in all working rooms, studies, libraries, kitchens, and nurseries. Very special attention should be given to the special uses of the light in each case, with emphasis on harmony of result rather than self-conscious effect.

What has been said, therefore, leads to the conclusion that for domestic work decorative lighting is a medium which must be used sparingly and with the greatest care if a "road house" home is to be avoided.

Lighting Fittings.

We come next to what is still the chief factor in home lighting—the fitting. No doubt those magnificent crystal and cut-glass candelabra of the past, when lighted with candles in rooms suitable in size, proportion, dignity, and furnishings must have been

a grand form of decorative lighting. But those days are gone for good or ill, and few of us can expect to live in homes containing such rooms to-day.

The earliest forms of fittings, both for gas and electricity, were primitive and in some cases very ugly, but the method was at least a straightforward one. Then came the idea of making fittings to look like something which they were not—candles (even to the artificial grease!), lanterns, oil lamps, etc., period lighting supposedly to suit period rooms. But as such rooms knew neither gas nor electricity or, for that matter, modern plumbing, this was merely an anachronism. (The local authority would ban "period plumbing," so why not treat the lighting in the same honest manner?) This approach to lighting, indeed, seems to be quite wrong, and in the long view is commercially unsound.

As general furnishing became simpler lighting fittings did not follow suit, and became out of all proportion too insistent in appearance for the simple function they performed. Architects had difficulty in finding suitable fittings, if and when they were allowed to do so by their clients. Then, about ten years ago, there came from the Continent what were known as architectural fittings — simple curved and spherical shapes in obscured glass, which could be screwed to the wall or ceiling, obviating flexes and giving a better distribution of light. They were soon in great demand.

"Architectural Lighting."

It was the demand by architects which drew the attention of the more enlightened designers to their needs, and a certain amount of credit should be given to them for the improvement in the design of fittings which is apparent to-day. There are now showrooms where well-designed and interesting fittings, suitable for contemporary interiors, may be found. Standard desk and reading lamps should be included with fittings, and may have a definite decorative value in a room. Gas fittings also show improvement in recent years. Designers of such fittings should, however, develop a real gas-lighting technique and not merely be content to show that some new type of fitting can be applied to gas as well as to electricity!

Fluorescent Tube Lighting

A New Departure in Stores

The new "Hall Crown" store at Croydon illustrates a novel development in store lighting, being illuminated exclusively by Osira fluorescent tubes.

The scheme designed by the architect, Mr. Oliver P. Bernard, in collaboration with the General Electric Company, Ltd., includes some 2,960 ft. of 20 m/m. Osira fluorescent tubing, devised in horizontal formation of two outer blue-white and one inner gold tube. In certain departments where it is desired to give emphasis in the blue end of the spectrum, one blue, one blue-white, and one blue-gold tube are employed.

The store is equipped with continuous wall counters and movable island counters, designed on the unit principle by the architect to allow mobility of layout, and each furnished with its section of triple tubing, overhead and parallel to the outer edge of each counter. The tubes are suspended 9 ft. above the floor by means of special hangers, 3 ft. from the ceiling.

The tubes are divided into triple sections 5 to 9 ft. long, between electrode boxes to facilitate renewals, and the lighting of the counters can be controlled in groups; all gold (middle) tubes are on separate switches. The current consumption is about 17.5 watts per ft. of triple unit, and an illumination of 12 foot-candles is provided.

Fig. 1. A close-up of window showing the effect of the Osira fluorescent tubular lighting in the "Hall Crown" store at Croydon.

The system provides almost shadowless illumination, and the special qualities of the electrical discharge also impart remarkable "vitality" to merchandise, which is displayed vividly as in bright daylight.

The window lighting consists of some 318 ft. of triple tubing, installed in special reflectors devised to conceal the tubes from outside observation.

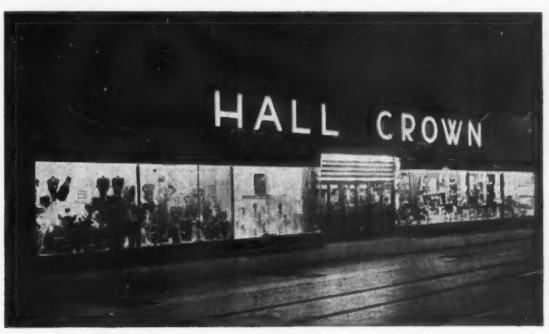


Fig. 2. A night view of the store showing facia and window lighting.

The exterior lighting is characterised by a spectacular facia sign reading "Hall Crown, Ltd." in fluted letters of Staybrite steel, 3 ft. 6 in. high. The letters are illuminanted by triple 15 m/m. Cleora fluorescents, the middle tube of yellow and the two outer tubes of ivory.

Fig. 3. An interior view showing arrangement of fluorescent tubing over counter facing main entrance.

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from page 125, May, 1938.)

II.—PHOTOMETRY.

137. A Recording Photoelectric Spectroradiometer.

V. M. Albers and H. V. Knorr. J. Opt. Soc. Amer., 28, pp. 121-123, April, 1938.

A recording spectroradiometer is described which has been constructed for use in absorption spectra measurements in the visible and near infra-red regions. A Hilger quartz monochromator and an emission type photoelectric cell are used. The photoelectric cell current is amplified by a d.c. amplifier, and the output of the amplifier actuates a recorder which produces an inked record. F. J. C. B.

138. A Submarine Photometer for Studying the Distribution of Daylight in the Sea.

C. L. Utterback and P. M. Higgs. J. Opt. Soc. Amer., 28, pp. 100-102, April, 1938.

The paper describes the construction of a photometer which is designed to measure narrow spectral bands of submarine daylight. The photometer is capable of making rapid and nearly simultaneous measurements of both transmitted and scattered light. The design permits of operation from a boat. F. J. C. B.

139. The Design of Monochromatic Filters for the H-3 Mercury Lamp.

Elizabeth M. Stoats. J. Opt. Soc. Amer., 28, pp. 112-120, April, 1938.

Monochromatic glasses have been designed for use with the H-3 type mercury lamp utilising caesium and sodium surface photo-cell tubes, the selenium surface barrier-layer cell, the thermopile and the eye as detectors. Curves are given showing the best values of purity and transmission at the desired wavelength for the various source-filter-receiver combinations. F. J. C. B.

140. On the Calculation of Absorption Coefficient of Daylight in Natural Waters.

R. J. Young. J. Opt. Soc. Amer., 28, pp. 95-99, April, 1938.

The paper discusses certain considerations involved in the calculation of absorption coefficient when one takes into account the nature of the light incident on the surface. F. J. C. B.

141. Reflection Factors of Acoustic Materials.

J. M. Smith and L. S. Ickis. Am. Illum. Eng. Soc. Trans., 4, pp. 373-378, April, 1938.

Data are given for the light reflection factors of a large number of sound absorbing materials much used for interior finishes in modern buildings. The materials tested are all produced in America. J. S. S.

142. A Light-Sensitive Cell Reflectometer.

G. R. Baumgartner. Am. Illum. Eng. Soc. Trans., 4, pp. 379-384, April, 1938.

The reflectometer consists of a 10-inch sphere, finished matt white inside, on which is mounted a small lens projector. The light from this projector can fall either upon the wall of the sphere or upon the test sample which closes an aperture in the sphere. The readings on a microammeter connected to a pair of photoelectric cells within the unit give a measure of the reflection factor of the sample. J. S. S.

143. 500-Watt Bipost Lamp.

Anon. G.E. Review, 4, p. 211, April, 1938.

A 500-watt bipost general service filament lamp has now been introduced similar in general design to the 1,000-watt and 750-watt types already on the market. The average lumen output is given as 9,100—500 lumens more than the normal spherical bulb lamp. Overall length of the lamp is 7½ in., and the diameter is 2½ in. J. S. S.

144. The Tellurium Vapour Lamp.

Anon. Am. Illum. Eng. Soc. Trans., 4, p. 310, April, 1938.

A tellurium vapour lamp is described, consisting of an inverted U-shaped quartz tube, containing liquid tellurium and neon gas, the latter assisting starting. It is stated that with suitable conditions of temperature and pressure, the quality of the light emitted approaches that of sunlight. High efficiencies should be possible, if troubles given by the quartz tube can be overcome. J. S. S.

III.—SOURCES OF LIGHT.

145. Recent Developments in Gaseous Discharge Lamps.

S. Dushman. J.Soc.Mat.Pic.Engineers, Amer. Vol. XXX., No. 1. p. 58, January, 1938.

The luminous and electrical characteristics of a number of vapour lamps that have attained practical importance in recent years are described. The latter part of the paper contains a discussion of recent developments in utilisation of fluorescent materials in gaseous discharge lamps. F. J. C. B.

146. H.P. Mercury Lamps.

"*Pharos.*" Elect. 120, p. 510. April 22,, 1938.

A discussion is given of the use of mercury lamps for interior lighting purposes with particular reference to blending with incandescent sources. C. A. M.

147. 50,000 Watts of Artificial Sunshine.

T. P. Brown. Magazine of Light, VII., No. 4, pp. 10-11. Spring, 1938.

Details are given of the use of a 50 kw. incandescent lamp to simulate sunshine in the inspection of cars. C. A. M.

148. "Photoflash Lamps Diminish in Size."

Anon. Am. Illum. Eng. Soc. Trans., 4, p. 309, April, 1938.

Miniature photoflash bulbs containing metal foil have been announced in America. The first, No. 7, is 1⅞ inches in diameter, and is said to develop 22,500 lumen seconds. The second lamp is larger, being 2⅜ inches in diameter, and is rated at 30,000 lumen seconds. J. S. S.

IV.—LIGHTING EQUIPMENT.

149. Horizontal Street Lanterns.

R. Maxted. El. Rev. Vol. CXXII., No. 3,155, p. 681. May 13, 1938.

Outlines the principles of installation layout, and advocates a form of lantern design which enables a polar curve to be obtained which is a compromise between high intensities at high angles as required to give high road brightness, and low intensities to reduce glare. R. G. H.

150. Vitreous-Enamelled Steel Reflectors for Electric Lighting (Open Dispersive Type).

(British standard specification No. 232 —, 1938; Revised, April 1938).

This revised specification covers nine sizes of reflectors, the materials, dimensions, and qualities of which are specified. The luminous output of the combined lamp and reflector must not be less than 60 per cent. of that of the lamp alone, for 40 w. and 60 w. lamps, nor less than 70 per cent. for 100 w.-1,500 w. units. The distribution of light is also indicated, and the angle of cut-

off is confined to 70 deg. from the downward vertical axis of the reflector. J. S. D.

151. Tungsten Filament Electric Lamps and Fittings with Partial Daylight-Colour Correction.
(British Standard Specification No. 793 —, 1938; April, 1938).

Following the introductory explanation of standards and definitions, the Specification for Lamps and Fittings are separately presented. Besides meeting general requirements, lamps and fittings must satisfy conditions imposed in a diagram for a range of colour temperatures between 4,200 deg. K, and 5,500 deg. K. The method of test in a photometric integrator is explained. Where a colorimeter is not available for determining the colour of the light, approximate methods, based on the use of coloured solutions specified in an appendix, may be used.

152. Superimposed Control on Low-Tension Networks.
Anon. El. Times, 93, pp. 305-307, March 3, 1938.

A full description of a control system for street lighting and similar net works. Various illustrations and diagrams are given. W. R. S.

V.—APPLICATIONS OF LIGHT.

153. Light and Architecture.
Anon. Am. Illum. Eng. Soc. Trans., 4, pp. 311-316, April, 1938.

Some representative architectural lighting schemes are described with photographs. J. S. S.

154. American Recommended Practice of School Lighting.
Committee of American Illuminating Engineering Society. Am. Illum. Eng. Soc. Trans., 4, pp. 321-372, April, 1938.

A very complete summary of American practice in all branches of school lighting is given. A section dealing with general principles is followed by recommendations for the best results with natural and artificial illumination. Details of wiring and control are also discussed. J. S. S.

155. Modern Office Lighting.
Anon. Magazine of Light, VII., No. 4, pp. 16-17, Spring, 1938.

Brief descriptions with photographs are given of five typical modern office lighting installations. In some cases 50 foot-candles are approached. C. A. M.

156. Modern Hotel Lighting.
Anon. El. Times, 93, p. 589, April 21, 1938.

Illustrates and describes lighting installations in two hotels in the South of England, for which the fittings were specially designed. W. R. S.

157. More Light for Industry.
Anon. Magazine of Light, VII., No. 4, pp. 21-24, Spring, 1938.

Seven typical industrial lighting installations in America are described with photographs. Combination lighting is used extensively, and in all cases high levels are obtained. C. A. M.

158. Industrial Efficiency.
"Works Engineer." Elect., 120, p. 576. May 6, 1938.

A discussion is given on the use of floodlighting equipment on outdoor industrial operation. C. A. M.

159. High Light Intensity for Newspaper Plant.
Anon. El. World., 109, p. 1,222. April 9, 1938.

The lighting arrangements at a Californian newspaper office are described. The extra high intensity for exacting work is obtained by large luminous hoods. S. S. B.

160. Lighting in Coal Mines.
Anon. El. Times, 93, p. 568, April 14, 1938.

A summary is given of a series of papers read at a meeting of the South Wales Branch of the Association of Mining Electrical Engineers. Mains lighting, hand lamps, and compressed air lamps were among the subjects dealt with. W. R. S.

161. Lighting for Selling.
Anon. Magazine of Light, VII., No. 4, pp. 30-35, Spring, 1938.

A selection of shop lighting installations in America are described with photographs. In one case a general lighting value of 110 foot-candles is obtained. C. A. M.

162. Lighting in Shops and Stores.
R. O. Ackerley. G.E.C. Journal, IX., pp. 140-152, May, 1938.

Problems associated with all forms of lighting both inside and outside shops and stores are dealt with in detail. C. A. M.

163. Store Lighting Trend Exemplified at Woolworth's.
Anon. El. World, 109, p. 1,201, April 9, 1938.

A brief description and photographs are given of the lighting in the new Woolworth store in New York. S. S. B.

164. High-Level Lighting.
Anon. Magazine of Light., VII., No. 4, pp. 12-13, Spring, 1938.

Details are given of the lighting equipment in one of the F. W. Woolworth stores in America, in which illumination values between 50 and 60 foot-candles are obtained. C. A. M.

165. Showrooms at Manchester.
Anon. Elect., 120, p. 601, May 13, 1938.

Details are given of the lighting equipment of showrooms at Manchester, in which nearly 4,000 ft. of fluorescent tubing are used. C. A. M.

166. Studio Lighting Committee Report.
J. Soc. Mot. Pic. Engineers, Amer., Vol. XXX., No. 3, p. 294, March, 1938.

A brief description is given of new trends in cinema studio set lighting. F. J. C. B.

167. The Principles of Street Lighting.
W. A. Villiers, B.Sc., A.C.G.I. El. Times, 93, pp. 621-622, April 28, 1938.

Discusses and illustrates the cut-off and non-cut-off systems of street lighting. The non-cut-off system is claimed to have more general application at present. W. R. S.

168. Street Lighting.
Anon. El. Rev., Vol. CXXII., No. 3,152, p. 571, April 22, 1938.

Discusses the Ministry of Transport Report on street lighting. Some criticism of the division of all roads into two classes is made, and also it is put forward that the Committee framing the Report did not give sufficient consideration to the cut-off system of street lighting. R. G. H.

169. Road Surfaces and Street Lighting.
Editorial. Beama Journal, 42, No. 10, pp. 103-104, April, 1938.

Some results of an investigation carried out by the Massachusetts Institute of Technology on the surface reflection characteristics of three road surfaces are discussed. C. A. M.

170. Highway Safety.
Anon. Magazine of Light, VII., No. 4, pp. 18-19, Spring, 1938.

Photographs with descriptions are given of a number of modern street lighting installations in America. C. A. M.

171. Road Safety by Night.
P. J. Robinson, M.Eng., M.I.Mech.E., M.I.E.E. El. Times, 93, pp. 507-509, April 7, 1938.

Gives a description and arguments for a cut-off system of street lighting. W. R. S.

172. Pioneer All-Mercury Street-Lighting Job.
Anon. El. World, 109, p. 1,129, April 2, 1938.

The article describes what the author believes to be the first all-mercury street lighting installation in America. 85 watt and 250 watt lamps are used, mounted horizontally, and a filament lamp, with a cut-out, is used in the starting of the low-wattage lamp. S. S. B.

173. The Empire Exhibition.
Anon. El. Rev., Vol. CXXII., No. 3,154, p. 637, May 6, 1938.

Describes, with photographs, the lighting effects at the Exhibition at Glasgow. Illuminated fountains are a prominent feature of the Exhibition. R. G. H.

174. Empire Exhibition.
Anon. El. Times, 93, p. 537, April 7, and p. 546, April 14, 1938.

Describes briefly some of the spectacular lighting effects of the Glasgow Empire Exhibition. W. R. S.

Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

No. 480,511. "Improvements in and Relating to Electric Incandescent Lamps."

The British Thomson-Houston Company, Limited, Dated July 29, 1936. (Convention, U.S.A.)

In order to prevent convection of vapourised particles of the filament metal to the walls of a gas-filled bulb having a filament located between a pair of leads and substantially in a single plane containing the leads, according to this specification, a flat screen is located between the leads and closely adjacent and substantially parallel to the plane of the leads and above the filament so that when the lamp is in use it is in the path of particles vapourised from the filament which are mainly condensed thereon.

No. 481,224. "Improvements in or Relating to Spot-Light Projection Apparatus."

The General Electric Company, Limited, and Turner, H. J. A. January 4, 1937.

This specification relates to projection apparatus for producing a beam of which the angular width is adjustable within predetermined limits. The apparatus comprises a concave mirror along the axis of which the light source is movable over a range, part of which at least is farther from the mirror than the focus nearest to the mirror. A screen is fixed relative to the source so as to move with it, and intervenes between the source and part of the mirror so that the area of the mirror upon which light impinges decreases with decrease of the distance between the source and the mirror. The screen may be a cone co-axial with the mirror, the sides thereof being parallel to rays reflected from the mirror when the source is farthest from the mirror.

No. 481,420. "Improvements in Electric Arc Lamps."

Körting and Mathiesen Aktiengesellschaft. December 24, 1936. (Convention, Germany.)

According to this specification the three electrode holders of a three-phase arc lamp are mounted upon arms which are directly controlled by a single electromagnet equipped with a voltage winding and two opposed current windings connected in different phases. The voltage winding is connected between the two phases in which the two current windings are connected in series.

No. 481,460. "A System for Artificially Lighting Rooms while Preventing the Passage of Light Rays from the Room."

Blom, A. V., and Schnyder, H. December, 28, 1936. (Convention, Switzerland.)

This specification describes the lighting of a room from a substantially, but not purely, monochromatic source. The windows transmit only light of colour complementary to that of the source. The colours are such that incident daylight is not unduly absorbed by the windows. An orange-red light source and light blue windows are suggested

No. 482,012. "Improvements in High-Pressure Mercury Vapour Electric Discharge Devices."

The General Electric Company, Limited, Francis, V. J., and Ryde, J. W. February 5, 1937.

This specification relates to high-pressure mercury vapour discharge tubes having running electrodes not thermionically activated and a starting electrode from which the discharge passes to the running electrode when the voltage drop becomes sufficiently high. A baffle, impenetrable to the discharge, intervenes between a starting and a running electrode so as to substantially increase the amount by which the discharge path between the starting electrodes exceeds that between the running electrodes. The baffle may be a plate of refractory material through which a rod carrying or forming the running electrode passes, so that the running electrode is on the side of the plate nearest the opposite running electrode and the starting electrode is on the other side of the plate.

No. 482,029. "Improvements Relating to High-Pressure Metallic-Vapour Arc Lamps and to the Manufacture of such Lamps."

Egyesült Izzólámpa és Villa-Mosságí Részenytarsaság. June 23, 1936. (Convention, Hungary.)

According to this specification a better light distribution and other advantages are obtained by fixing the electrode of a high-pressure vapour arc lamp side by side and close together in a bulb-like envelope such that imaginary straight lines connecting any given point of the arc with the points of sealing the electrodes to the envelope enclose an angle of less than 180° and so that the imaginary straight line joining the active ends of the electrodes is wholly within the gas space of the envelope. The discharge path length is less than eight millimetres.

No. 482,070. "Electric Discharge Lamps."

Vereinigte Gluhlampen und Elektrizitäts Aktiengesellschaft March 21, 1936. (Convention, Austria.)

This specification covers a discharge lamp having solid incandescent electrodes, a filling of rare gas and mercury vapour, and a discharge path within a tube of less than 5 mm. internal diameter, a high internal pressure and voltage drop of 500 volts per cm. in which at least one electrode is so small that it attains an operating temperature of at least 2,200° C. and yields at least 1 per cent. of the total light emitted by the lamp. The light of the small electrode compensates for deficiencies in the spectrum of the discharge.

No. 482,601. "Improvements Relating to Electric Lighting or Signalling Apparatus."

Chance Brothers and Company, Limited, Hallett, L. B. H., and Stacey, N. A. W. November 4, 1936.

According to this specification a lamp in which a failed bulb is automatically replaced comprises a main lamp and a stand-by lamp mounted upon a common pivotal carrier and arranged in different circuits, and an electro-magnet control device provided with a pair of opposing windings, one in series with, and the other in parallel with, the main lamp. A catch holds the carrier in the position in which the main lamp is operative. When the main lamp fails the current through the series winding is cut off, and that through the shunt winding causes the electromagnetic device to release the catch and the carrier turns to bring the stand-by lamp into operation.

EDISWAN LIGHTING EQUIPMENT

"ESCURA" ELECTRIC DISCHARGE LAMPS

The "London Major" Refractor Lantern. Suitable for the lighting of main traffic roads and built-up areas.

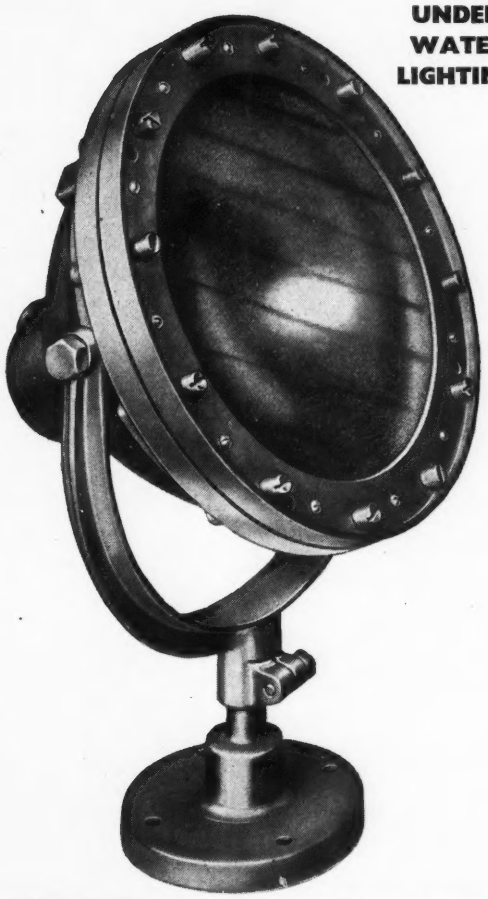
"Northbury" Reflector Street Lantern. Suitable for either side or centre of road mountings.

"Waltham" Floodlantern. For garages, road houses, swimming pools, etc., etc.

"Sirius" H. Floodlight Projector. For floodlighting of high buildings, monuments, towers, etc., etc.

"Vega" Floodlight Projector. For the lighting of monuments, towers, church spires, etc., etc.

UNDER WATER LIGHTING



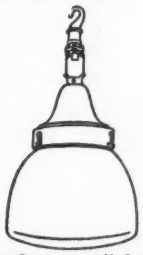
The "NEPTUNE" series of submersible projectors is typical of the Ediswan range of underwater lighting equipment, for the illumination of fountains, cascades, swimming pools, etc.

Installations include:

EMPIRE EXHIBITION GLASGOW GREAT YARMOUTH SOUTHSEA BOURNEMOUTH HULL LEEDS ISLE OF MAN ROTHSAY STEPNEY HOLBORN

COMPLETE SCHEMES PREPARED WITHOUT OBLIGATION

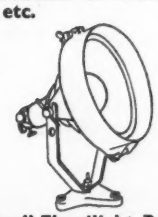
"London Minor" Refractor Lantern. Suitable for the lighting of secondary roads and side streets.



The "Concours" Lantern. For general interior or exterior lighting, railway platforms, etc.

"Argus" Floodlight Projector. For the ornamental lighting of public and commercial buildings, parks, etc., etc.

"Neptune" Projector. For underwater lighting and the illumination of fountains, etc., etc.



"Mars" Floodlight Projector. A heavy duty projector for use in any location where a long throw is required.

ROYAL "EDISWAN" LAMPS

L.E.34

THE EDISON SWAN ELECTRIC CO. LTD., 155 CHARING CROSS RD., LONDON, W.C.2

Fig. 1. The Palace of Industry (North), at the Empire Exhibition, Glasgow, which contains 155 stands, brilliantly floodlighted at night. In the background the famous Tower of Empire, also the subject of G.E.C. floodlighting, is seen.

Lighting at the Empire Exhibition, Glasgow

Some Further Illustrations

In our last issue we gave an illustrated account of some of the water-lighting at the Empire Exhibition, and in the previous (April) issue we presented some sketches furnished by the General Electric Company, Ltd., illustrating some of the general lighting effects. We are again indebted to the General Electric Company, Ltd., for the night photographs now presented, showing the use of G.E.C. lighting for a number of the chief buildings, terraces, etc.

It will be seen that very general use of indirect and concealed lighting is made, some of the lighting units being reminiscent of those developed at Continental exhibitions such as that held in Paris last year. The lighting follows the accepted principle that glare should be avoided, the light being skilfully used to effect two purposes—to show up the exteriors of buildings and at the same time to illuminate the numerous terraces and staircases and

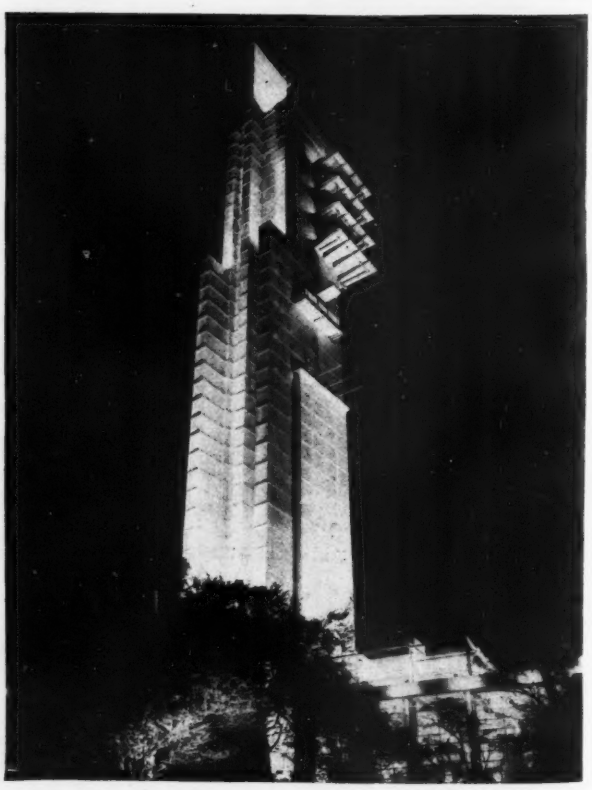


Fig. 2. A striking view of the Tower of Empire, floodlighted at night.

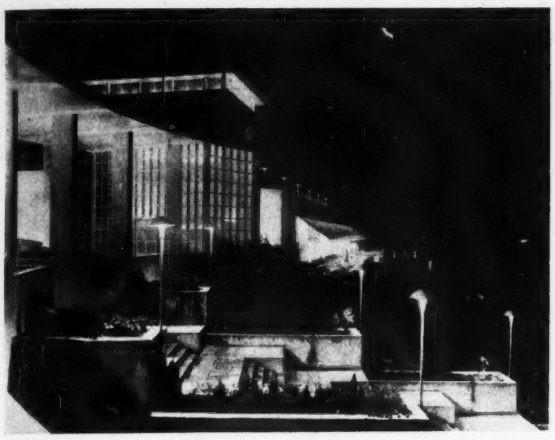


Fig. 3. Brightly illuminated terraces form a pleasing feature of the Exhibition. The distinctive "umbrella" lighting units are seen in the foreground.

Fig. 6. A novel effect produced by the unusual arrangement of G.E.C. spherical fittings, accentuating the curves in the interior of the Garden Club.

passages. Whilst the Tower of Empire, illuminated in colour, and the floodlighted cascades and fountains probably form the most spectacular items, the general lighting of the grounds, where there are some

Fig. 4. A view looking towards the Palace of Art, with the Scottish pavilions on either side.

Fig. 7. One of the main entrances to the Exhibition, brightly silhouetted at night.

1,500 floodlights, about 400 standards, and thousands of fairy lights in use, has been the subject of favourable comment.

The general view of those who have visited the Exhibition appears to be that the lighting as a whole is a workmanlike job. The buildings and the lighting together form a dignified and interesting whole, without being unduly theatrical.

One is also glad to get the impression that the Exhibition is being well patronised, and is likely to be—what is not achieved by every effort of the kind—a financial and commercial success.

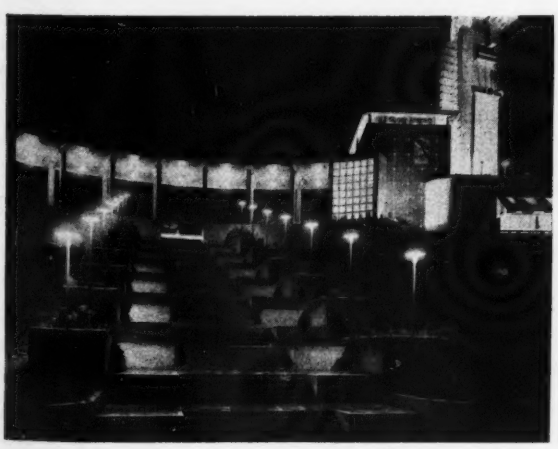


Fig. 5. The terraces of the Garden Club, showing the effective lighting on either side of the central stairway.

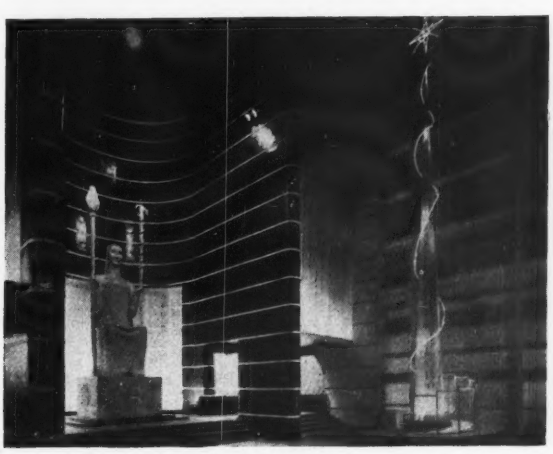


Fig. 8. Inside the entrance of one of the Scottish pavilions; an imposing effect with original lighting effects.

"Effects Projection" by Ultra-Violet Light

The G.P.O. Pavilion at the Empire Exhibition, Glasgow

(Specially contributed.)

The pavilion is oval in shape and has two floors, as shown on the plan. The ground floor covers the whole area, whilst the first floor consists of a platform in the centre of the hall with a 5-ft. gallery round the outer edge. (See Fig. 1.) There are eight pillars round the gallery, running straight to the ceiling, and the principal problem was to provide once every ten minutes a lighting display illustrating in a diagrammatic manner the activities of the Empire Air Mail.

The Problem.

For this display it was desired to provide a moving aeroplane travelling right round the pavilion over maps representing various parts of the British Empire. It was obvious from the start that the simplest method to provide this aeroplane was to project from a rotating lantern in a central point in the hall. This, however, was not so simple as it seemed. There is a mast in the centre of the pavilion which runs from the ground floor right through the ceiling out into the open. It was therefore impossible to place the projector in the centre of the pavilion, while if it were displaced to one side or the other, at one part of its travel it would be obstructed by this mast. It was decided to use two projectors, one to cope with the left-hand side of the pavilion and the other for the right-hand side. These projectors would be synchronised in a manner described later, so that when one projector had finished its side of the room it changed over instantaneously to the other projector which carried on and gave the impression of one continuous travel of the aeroplane.

The next point encountered was the need to project the light on the walls only, and give the impression of the aeroplane passing behind the eight pillars previously mentioned.

Using ordinary visible light projection this presented several difficulties. Owing to the relation of the diameter of the projection gate to the travel of the projector [Note: The whole projection apparatus, turntable and all, had to be concealed inside a dummy column 3 ft. in diameter], to provide masks which would provide a clear-cut obstruction at the position of each column was not a feasible proposition. A moment's thought on the part of the reader will easily show the reason. A mask to do this would have to be constructed in three tiers brought in at appropriate times of the travel. The same section of mask could not be used over and over again, as due to the oval shape of the columns, the spacing between black and light sections is not always the same.

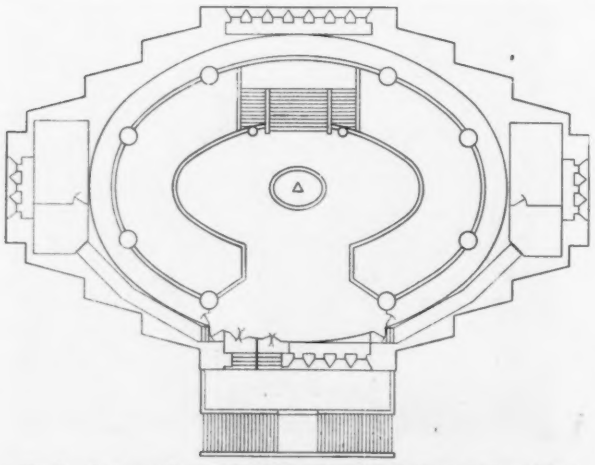


Fig. 1. A general view of the first floor of the General Post Office Pavilion, in which the display took place.

There was another objection to using ordinary white light projection, in that the rays from the column in which the projector was concealed to the travelling aeroplane would be visible, and this would indicate to the public how the job was done and thereby detract considerably from the attractiveness of the display. In any case, whatever form of projection was used, the main hall lights would have to be dimmed, both to enable the public to concentrate on the display and furthermore to render the aeroplane projection sufficiently intense.

Use of Ultra-Violet Radiation.

Taking every consideration into account, the Post Office Engineers Department, in conjunction with Mr. Bentham and Mr. Bear, of the Strand Electric and Engineering Company, Ltd., decided to adopt projection by ultra-violet rays (sometimes described as "Blacklight"). Ultra-violet radiation, or at least that region of the spectrum just beyond the visible section, which is, as is well known, invisible to the human eye unless projected on certain chemicals which they have the property to excite to give off visible light, this property being known as fluorescence. The most suitable source of ultra-violet radiation was the 125-watt black bulb mercury discharge lamp. By choosing suitable chemicals fluorescence in various colours can be obtained.

Courtesy: G.P.O. Display.

Fig. 2. A photograph showing the actual fluorescent effect due to ultra-violet radiation projected on the ceiling. Although some of the ordinary balcony lighting has been left on, the clouds can be clearly seen. The aeroplane is on the extreme right.

Furthermore, certain chemicals are invisible under white light, that is, it is possible to have a piece of white paper, which under white light appears as a plain white sheet, but under ultra-violet radiation presents a blue cross on a black ground.

The application of this "blacklight" to the particular case under discussion is evident. If the projectors project an aeroplane of ultra-violet light no ray would be visible, and, furthermore, no aeroplane would be visible except where the wall was treated with special chemical paints. Thus, by treating the wall between the columns and also painting the maps with fluorescent paint, invisible blue and visible red respectively, and not treating the columns, the aero-

plane was able to travel around the room without any apparent source of projection, and, furthermore, was able to vanish behind the columns in the desired manner. This type of projection has, as far as is known, never been carried out before in the world, and not only on account of the aeroplane projection, but on other projections, the Post Office Pavilion represents a most daring experiment.

To add to the effectiveness of the display, the whole of the ceiling of the pavilion was treated with invisible blue ultra-violet paint, and around the gallery sixteen projectors were provided, fitted with photographic glass discs, so that the ceiling could be covered with images of clouds. The majority of these glass discs are driven by small silent running electric motors at a speed of one revolution in five minutes, this giving the illusion of clouds travelling right across the hall. To treat the ceiling with the fluorescent paint was rather a problem, as the chemical itself is made up in a solution which is highly inflammable (at the present stage of development, at any rate). To spray a large area such as this ceiling (which is 3,500 sq. ft.), would have been unduly risky, so standard wallpaper was specially treated, and this was pasted up by paperhangers, in a perfectly ordinary manner.

Associated with this display is an automatic dimmer and timing device, which ensures that once every ten minutes the display is put into operation, the display itself lasting just over a minute.

Apparatus and Equipment.

The projectors for the aeroplane effects necessitated a considerable amount of experimental work. As previously mentioned, the projection of fixed designs or patterns, such as an aeroplane or clouds, had never been carried out before, and therefore there was no experience to go on in this matter. The throws also were rather long, being in the neighbourhood of 30 ft. The aeroplane lanterns have a lens system designed to collect the maximum solid angle of light from the black lamp. In the case of designing an optical system for use with a black lamp it is not possible to use reflectors behind the lamp, as by the time the ultra-violet light travels out through the lamp bulb, hits the reflector, returns through the black bulb, making three times in all, the resulting light is not worth anything at all. Therefore, in the case of projectors for the Post Office Pavilion, optical systems were designed which collected the maximum solid angle forward of the lamp and not subject to obstruction by it. Immediately in front of the black lamp a 4¼-in. diameter meniscus lens is placed, and subsequently three further lenses were used to collect the maximum amount of light possible.

One interesting fact arises out of the aeroplane projectors in that owing to the restriction of everything working inside a 3-ft. diameter column, the necessary lengths of focus tube to focus the requisite size aeroplane with the maximum gate aperture to pass as much light as possible could not be arranged in one straight line. Therefore, after the light passes through the aeroplane slide (in this case a cut out metal mask), it is deflected by a mirror back on its own tracks—so to speak—and then re-deflected by another mirror forward, and finally focused.

This arrangement cut down the length of the lantern by a considerable amount. In all cases, the lenses and reflecting mirrors were carefully designed not to obstruct the ultra-violet radiation, as far as possible. As is well known, ultra-violet radiation is appreciably lessened by passing it through glass, and that is why as the lenses are essential in projection it was so necessary to use an optical system of the maximum efficiency from the light collection point of view to counteract the wastage due to the transmission of the lenses. These two aeroplane projectors are mounted on rotating turntables fitted

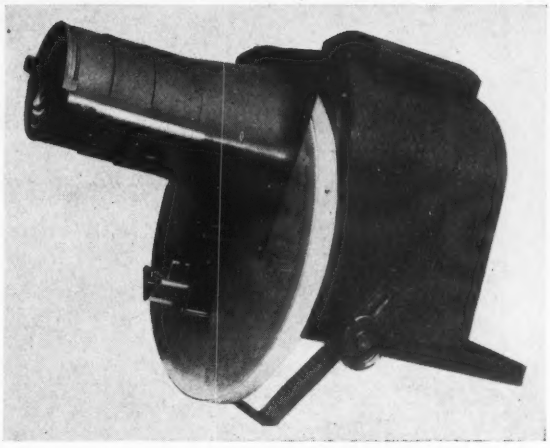


Fig. 3. The Ultra-Violet Radiation Projector.

with the necessary tilting arrangements to enable them to be accurately directed at the fluorescent track.

The front of the lantern is fitted with a magnetically operated blackout shutter which is brought into action automatically during the period when the aeroplane display is not in action. It is not possible with the 125-watt mercury discharge lamps to switch them on and black them out when required, owing to the two- or three-minute lag before obtaining the maximum luminosity. It was undesirable to show the aeroplane before the display, but it was equally undesirable for the aeroplane to attain maximum luminosity after the display was over.

The turntable mechanism incorporates a motor drive and slip rings to supply the black lamp and magnetic blackout shutter. Incorporated in the base of this turntable is a synchronising device. It is obviously essential, if the aeroplane is to travel round the room as one aeroplane and not as two, that the exact position of the aperture on the one projector shall correspond with that on the other. No difficulty would be experienced of course, once the apparatus was running, as two synchronous motors could be used, but trouble would be experienced in the start in that one motor might attain its full speed slightly before the other. To get over this difficulty, a slipping clutch is provided in the base of the turntable and the motors were started, and after they have attained their final running speed a magnetic catch is released and the two aeroplanes start off from exactly the same position.

The Cloud Effect.

The cloud effect utilised a completely different optical system from the aeroplane projectors, as in this case the beam angle required was considerably

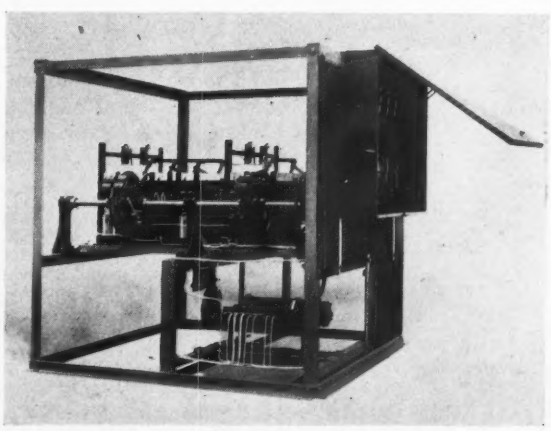


Fig. 4. A view of the Control Apparatus.

EMPIRE EXHIBITION SCOTLAND 1938

Among many other Contracts :

H.M. GOVERNMENT PAVILION

Lighting and Cloud Effects for largest Cyclorama in British Empire

G.P.O. PAVILION

3,500 square feet of ceiling treated with fluorescent paint. Optical Projection with Ultra-Violet Rays

RHODESIAN PAVILION

Complete lighting scheme for 100 ft. long model of Victoria Falls

STRAND ELECTRIC
AND ENGINEERING CO., LTD.
24, Floral Street, London, W.C.2

larger. Again, the maximum amount of light had to be collected from the front of the lamp, and to achieve this the Stelmar patent reflector unit was used. This reflector unit which is made up in metal chromium or rhodium plated is now well known, and so does not need to be described here, but may be mentioned in passing as it collects an extremely large solid angle. After the light has been collected by the Stelmar unit it is passed through a section of the rotating cloud slides, 8 in. square, and is then re-focused by a single 6 in. diameter plano-convex lens at the end of a telescopic front on to the ceiling. A certain amount of striation is obtained using this method, but for cloud projection this is not noticeable. The cloud effect discs are driven by an extremely small motor, which can be seen in Fig. 2, of new design, and although twelve discs are in operation no motor hum can be detected.

Dimming Equipment.

The dimmer bank is of the resistance type and arrangements are made to dim the total load in the hall upstairs and also in the hall downstairs. In the case of the downstairs, an adjustable limit is provided so that the lighting is dimmed to a pre-determined position and not extinguished completely.

Also associated with the dimmers are contactors to bring in the amplifier and noise effect for aeroplane noises, and switch on the cloud effects three minutes before the cycle is due to begin, to be sure that they shall have obtained their full luminosity.

An interesting feature of the dimmer is that a constant motor drive is provided in one direction. This drive operates a drum which carries out the necessary dimming and brings in the various circuits as required. Also driven from this motor are two constantly revolving shafts to which the dimmers are connected for moving by means of magnetic clutches. One shaft revolves at such a speed as to move the dimmers to the dim position in fifteen seconds. The other shaft revolves at such a speed as to move the dimmers to the up position in five seconds.

The appropriate magnetic clutches are energised from the drum, and dimming up or down at the various speeds required is entirely independent of the motor speed. The motor drives the whole device through a slipping clutch with a magnetic catch similar to those fitted on the aeroplane turntables. This catch is of course to ensure that not only the aeroplanes are both pointing in the same direction, but that they start with exactly the same relationship to the cycle each time. For instance, when the lights in the hall are dimmed the aeroplane has to appear in the centre of the Air Mail display and disappear in the same position. The delay action relay is provided so that when the start button is pressed all three motors—the dimmer motor and the two aeroplane projection motors—are rotating and after six seconds the magnetic catches are automatically cut out. Shutting down, contacts are provided in conjunction with the catches on the aeroplanes and dimmer, so that when the stop button is depressed the aeroplanes will continue to rotate until their catches fall in, whereupon their motors are shut down. The dimmer will also continue to rotate until it reaches an appropriate part of the cycle for its catch to fall in, whereupon the dimmer motor is shut down.

The whole of the apparatus was manufactured by the Strand Electric and Engineering Company Ltd., of London.

London Associated Electricity Undertakings

Regent Street Showrooms

A visit to the above showrooms is interesting, as they exemplify many of the very latest methods of equipment and combine, in an ingenious way, the illustration of principles of lighting with the display of representative fittings. The furniture and finishing are essentially modern. There is nothing to harbour dust and if there were any it would be obliterated by the very perfect system of air conditioning that is applied to the building. Of special interest, too, are the facilities for admission of daylight, such as the wall composed of glass bricks, which, we were assured, is not unduly expensive.

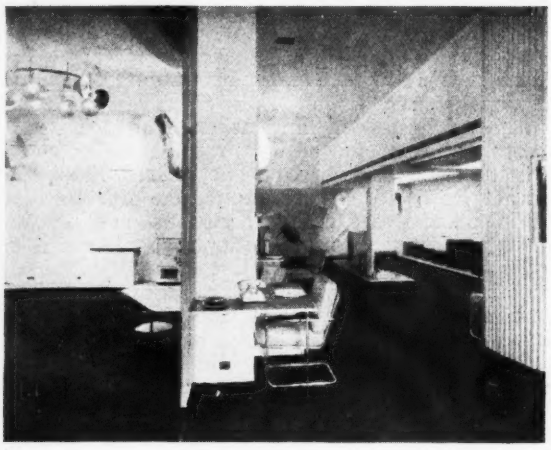


Fig. 2. One of the interior sections, with fittings visible in the background.

On the ground floor every advantage is taken of the large window display, one feature of the lighting being the skilful use of louvres to eliminate glare from the various spotlight projectors used for display. One of the most interesting features is the daylight illumination over the back portion of this area where there are wireless and television exhibits. Light of various colours is available and in the summer a cool daylight effect is to be aimed at. Meantime it was interesting to note that the heat involved in providing an illumination of 30 foot-candles is not at all troublesome—one has only a slight sensation of warmth when the full lighting is turned on.

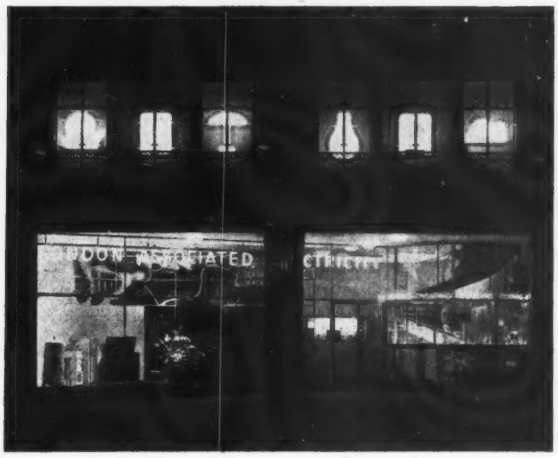
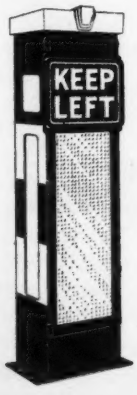


Fig. 1. A general view of the showrooms, lighted up at night.

Elsewhere visitors have opportunities of seeing in turn various systems of lighting—direct, semi-indirect, and totally indirect—giving the same order of illumination, which is checked by a portable photometer. The range of selected fittings is amplified by a series of thirty photographs, and there are numerous special displays illustrating the variety of lamps now available, their method of manufacture, and the largest (10 kW) and smallest in everyday use.

Fig. 3. Another view with a typical assembly of fittings in the background. The model "polar curve" apparatus can also be seen.

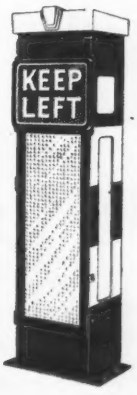


Please Read This

It is now established that there is an obligation upon all Local Authorities to keep their Bollards and Street Refuges lighted so long as it is dark, and this obligation is a continuing one if the Bollard or Refuge is a danger on account of darkness.

Now This

The "Radiovisor" Mark V A.C. Lighting Control Unit has its circuit so designed that should any component of the unit circuit become damaged the lighting which it controls is switched on and remains on. This is also a "Dusk to Dawn" control.



Specify the "Radiovisor" Mark V A.C. Unit for the control of the illumination of Street Refuges and Bollards.

RADIOVISOR PARENT LIMITED, 28 LITTLE RUSSELL STREET, LONDON, W.C.1

Illuminating Engineering in Australia

Shortly before the festivities connected with Sydney's Jubilee, the *Australasian Engineer* gave an account of all engineering activities throughout the country, including illuminating engineering. We take the opportunity of saying something of the work of the illuminating engineering societies in Australia, of which there are two, with headquarters in Melbourne and Sydney.

THE I.E.S. AUSTRALIA (VICTORA).

History.

In January, 1931, Mr. Trevor Hedbergh made the first appeal to all engineers concerned to form a society "to promote the general advancement of illuminating engineering and the dissemination of knowledge relating thereto," and a surprisingly favourable response lead to the formation of a society in April of that year, at Melbourne. Its first president was Mr. E. B. Brown, its third Mr. T. Hedbergh, its seventh Mr. T. F. Whitelaw, whilst the newly elected president for the forthcoming year is Mr. D. Wright. The membership has grown to 105. The society has been instrumental in promoting a course of illuminating engineering at the Melbourne Technical College.

Papers.

Many useful papers have been read before the society. In a recent paper Mr. A. B. Tubbs gave a survey of the development of lighting in the U.S.A., following an extensive journey in that country. He mentions the high standard of general street lighting equipment and the activities in road signalling, and comments on the decorative side of public lighting, such as fountain-illumination and the floodlighting of buildings.

"*Visible Radiation and Lenses*," a paper read by Mr. E. Goetz, contained an interesting analysis of the relation between the work of the opticians and that of the lighting profession. It summarises the systematic investigations by a German, Professor Vogt, on pathological changes due to radiation. The effects of ultra-violet radiation from the sun are thus summarised: Infra-red radiation down to 700 mm., in excess, may cause some damage to the outer tissues, the iris and lens retina or sclera of the eye. Visible light (400 to 600 mm.) causes glare and dazzle, and the resultant so-called "red vision." Ultra-violet radiation of 400—310 mm. is harmless. Below that value it can cause acute inflammation of conjunctiva and cornea, which, however, should disappear without treatment after a short while. These remarks refer only to highly concentrated radiations, but as the sun consists of 1 per cent. ultra-violet radiation only, and 60 per cent. infra-red, it is obvious that no protection against ultra-violet from normal sunlight is necessary. As a result of these results a range of glasses has been developed, which are designed to absorb excess of harmful radiation from the different light sources These are embodied in a new feature, "Contact Lenses" which are worn beneath the eyelid, directly over the cornea and pupil and adhere to the sclera (the white of the eye). Sportsmen, screen and stage actors have already taken advantages of such lenses and their utility is established.

In connection with the latter paper it is interesting to note a recent publication in the *Journal of Ophthalmology*, where Mr. S. K. Mukerjee reports the case of a sixteen-year-old Indian girl whose eyes became affected as a result of small pox in early childhood. Operation proving ineffective, it was decided to utilise contact glass This was painted inside to match the colour of the eye, and the result was completely satisfactory.

THE I.E.S. AUSTRALIA (NEW SOUTH WALES).

This section of the I.E.S. has also proved very successful. Membership at the end of last year was 147. Mr. F. C. Kelly has now succeeded Mr. A. E. Cooke as president. Numerous activities have been arranged for the forthcoming session. A stand is to be taken by the society at the Electrical and Radio Exhibition, 1938. In conjunction with manufacturers of illuminated signs, it is intended to form a committee for the purpose of negotiating with the city council in regard to legislation on this subject, and suggesting desirable amendments. Several interesting papers were submitted last session, three of which are abstracted below.

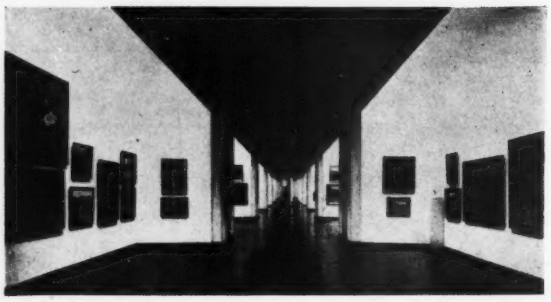
Celebration Lighting.

This is the subject chosen by authors of three of the papers. Mr. J. van Dyk discussed the floodlighting of buildings, emphasising the necessity of planning the scheme of floodlighting in accordance with the style of building to be treated. Mr. E. W. Harmer dealt with the illumination of streets and public places on festive occasions, and discusses lighting equipment for exhibition roads. An example of a standard composed of large luminous surfaces reflecting the light towards the road is reminiscent of some designs displayed at the Paris Exhibition. Finally, Mr. T. R. Hackman gave particulars of methods of garden lighting. He recommended low illumination values and low mounting height for "long-range subjects," such as spacious parts of parks, lawns, etc, whilst for "short-range subjects," such as the floodlighting of trees, he suggested making use of contrasting effects and the application of colour.

H. L. J.

Museum Lighting in Stockholm

The new Technical Museum which has recently been opened at Stockholm embodies some remarkable features in its lighting scheme. To avoid the difficulty of dealing with daylight and artificial light in the same room the former has been completely excluded. The accompanying illustration gives a vista of three of the exhibition rooms which are



illuminated by concealed light-sources installed behind an opal glass panel running throughout the whole room and erected above a lowered centrepiece. The walls of the room are slightly curved, and good distribution has been achieved by setting up 100 watt lamps at intervals of 30 ins. The illumination provided is of the order of 5 foot-candles.

VITAL-
TO PERFECTION
IN GAS LIGHTING

Absolute resistance to extreme heat and impinging flames—effective diffusion of light—exceptional protection for mantles—rare glare with little stoppage of light—exceptional protection for mantles—rare natural beauty and decorative charm. Such are the qualities essential to all-round efficiency in gas lighting. Only in Vitreosil Lighting Ware is this combination to be found.

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GAS LIGHTING WARE • HEAT CANNOT CRACK IT •

A LARGE VARIETY OF TASTEFUL DESIGNS AVAILABLE

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THE THERMAL SYNDICATE LTD.,
Head Office & Works: Wallsend, Northumberland.
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New Lighting in Southwark

An Important Installation of "Sieray-Dual" Lamps

The colour problem is one to which local authorities now pay considerable attention when installing new methods of lighting. It is perhaps somewhat surprising that more frequent use is not made of combination systems, in which tungsten filament lamps and mercury electric discharge lamps are combined in the same unit.

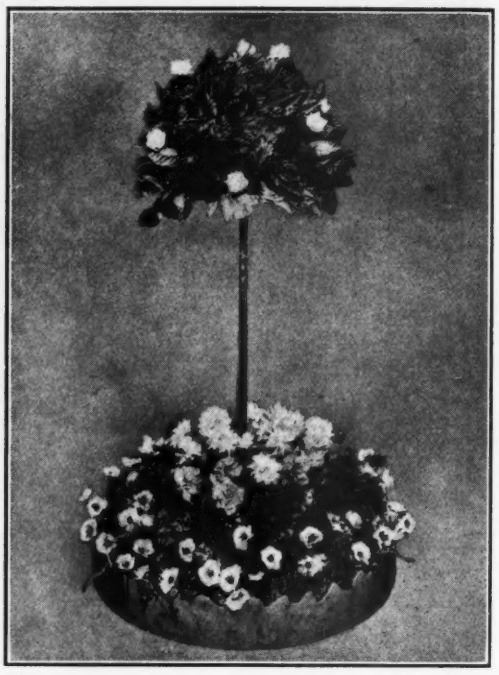
Combination of this type is most effectively obtained in the familiar Sieray-Dual lamp, introduced by Messrs. Siemens Electric Lamps and Supplies, Ltd., in which the tungsten filament replaces the choke coil and serves as a steadying resistance besides giving light. An important step, about eighteen months ago, was the introduction of a D.C. lamp of this type. Advantage of this lamp has been taken by the Borough Electrical Engineer of Southwark, Mr. D. M. Kinghorn, who recently arranged for a trial installation of D.C. Sieray-Dual lamps in Preston-Sieray lanterns at the Elephant and Castle and in Newington Causeway—believed to be the first street lighting installation of D.C. electric discharge lamps.

The satisfactory results obtained with this installation have led to the extension of the system to other thoroughfares, so that Newington Causeway, Elephant and Castle, Walworth-road, Camberwell-road, the Borough High-street, and other important roads are now all lighted with D.C. Sieray-Dual lamps. The basic spacing is 150 ft., and the mounting height 25 ft., and in general the system is staggered. In

A view of Newington Causeway, one of the series of roads in Southwark lighted by Sieray-Dual D.C. lamps. Owing to the exceptional width of the road a double staggered lay-out was adopted.

Newington Causeway, owing to the width of the road, a double staggered layout has been adopted. In the New Kent-road a centrally mounted system is used. All lanterns are equipped with raising and lowering gear to facilitate maintenance.

One of the thirteen artificial flower beds on the lawn of the Imperial Hotel, showing fluorescent effects produced by invisible rays from the Mercra lamp with ultra-violet filter bulb.



The same bed of artificial flowers as seen by natural light during the day.

Some Exhibits at the I.M.E.A. Convention

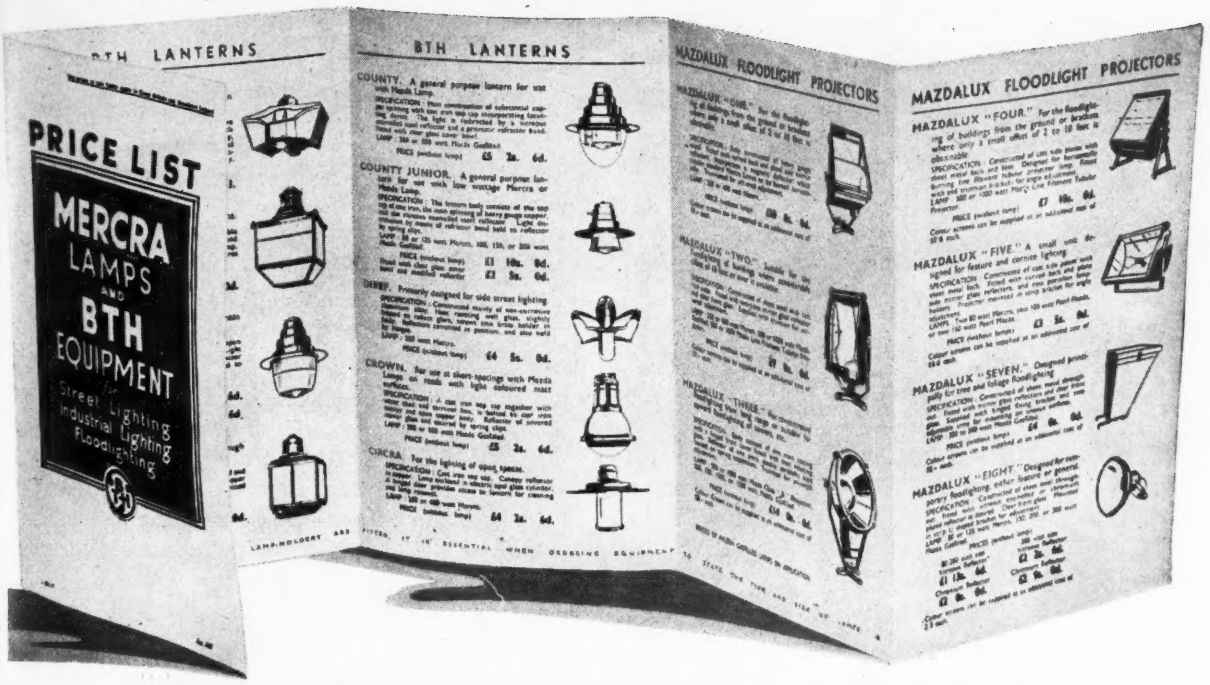
At the I.M.E.A. Convention, held in Torquay during May 23 to 27, electric lamps and fittings naturally figured largely at the stalls of exhibitors. Advantage was also taken of the fine natural setting to arrange floodlighting displays. The adjacent picture shows the treatment, by the British Thomson-Houston Company, Ltd., of the Imperial Hotel, the sea-front façade of which was illuminated by twenty-six floodlight projectors, the total load being approximately 30 kw. Other good effects were secured in the Rock Walk, where the foliage was illuminated by concealed projectors.

A novel and ingenious bit of special lighting was arranged by the same firm on the hotel lawn. A group of thirteen artificial flower beds had been laid out, the artificial blooms in each case being treated with fluorescent paint of various colours. As will be seen from the illustrations, quite a creditable effect was produced during the day under natural light. By night, however, when the flowers were illuminated by Mercra lamps with ultra-violet filter bulbs, each concealed in the foliage of a standard rose tree in the centre of the bed, the effect was much more striking, the flowers glowing in various colours against the dark background.

Fluorescent effects again figured at the stall of Siemens Electric Lamps and Supplies, Ltd. In addition to a special exhibit of Sieray and Sieray-Dual electric discharge lamps, there were two lamps utilising fluorescence—the now familiar luminescent

The Imperial Hotel, Torquay, floodlit by Mazda gas-filled lamps in B.T.H. Mazdalux projectors for the period of the Convention.

lamp in which it serves to counteract the deficiency in red rays common to all mercury vapour lamps, and the Sieray ultra-violet lamp, under which fluorescent materials respond readily to the invisible rays. Amongst the special applications of such lamps are for the detection of impurities (such as grease) and adulteration, the reading of invisible laundry markings, and the staging of effective decorative displays. At the same stall Siemens thermostatically controlled cookers, fitted with bimetallic thermostats and giving accurate control of oven temperatures up to 550° F., were on view. At this stall, as at



MERCRA LAMPS & BTH EQUIPMENT

for Street Lighting Industrial Lighting and Floodlighting

Intensive research and experiment in the BTH Laboratories at Rugby have resulted in many improvements in electric discharge lamps during the past few years. For example, the Mercra Lamp, originally available only in one size — 400 watts, is now made in four sizes, 400, 250, 125 and 80 watts.

BTH Equipment — Lanterns, Reflectors and Projectors — are of very high standard in both design and construction and are now available in a range of types and sizes sufficient to meet all the requirements of up-to-date street lighting, industrial lighting and floodlighting.

The new Mercra 'H' Street Lighting Lantern is a BTH development of major importance. The lantern embodies a magnetic deflector which makes it possible for a lamp of standard high efficiency to be burned horizontally, thus simplifying and improving the control and distribution of the light.

A comprehensive Price List of Mercra Lamps and BTH Equipment for all applications (see above illustration) has just been published. Please write for your copy.

B T-H
REGD. TRADE MARK

M 3753

THE BRITISH THOMSON-HOUSTON CO., LTD., CROWN HOUSE, ALDWYCH, LONDON, W.C.2.

The working model exhibited by the General Electrical Co., Ltd., to illustrate their street lighting control plan at the I.M.E.A. Exhibition.

others, typical examples of modern lanterns, reflectors, and floodlighting equipment were on view.

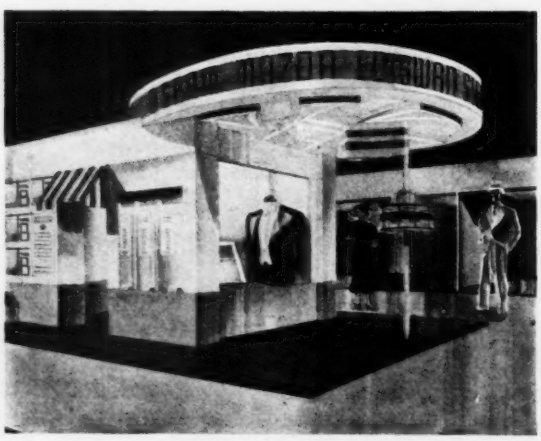
The General Electric Company, Ltd., were responsible for a display of street lighting control equipment, illustrated by the effective working model shown above. Another feature at this stall was the new Di-fractor lantern here illustrated. Yet another was a lantern for vertically burning 400 and 250 watt Osira lamps, fitted in the horizontal position.

The E.L.M.A. stall, a view of which appears below, was designed to show the many activities of the bureau and the wide range of electric lamps now available. Special attention was paid to discharge lamps, the possibilities of which, in combination with tungsten (filament) lamps, in stores were emphasised, as well as their application in streets and factories. This was illustrated by a special photographic display. The use of ultra-violet light to excite fluorescence, both as a means of improving the colour of light from discharge lamps and as an element in display, was well demonstrated—especially at a cabaret organised by the E.L.M.A., in which costumes impregnated with fluorescing materials played an important role.

The Holophane stall was divided into two parts, the main section being a display of street lighting equipment, and the remainder a group of prismatic glass units for other purposes. The street lighting units included the familiar axial, non-axial, and symmetrical varieties, in which the new Biway lantern is now available. The new "Halo" fitting for interior lighting, here illustrated, was an important element in the miscellaneous equipment. (The name is presumably associated with the wide circular "halo" of glass surrounding the three-tier prismatic body.) Other lighting units included the large 150 watt Widerlite bulkhead, vertical burning floods, and a variety of the Controlens plates used in connection with the "built in" system of lighting.

The new G.E.C.Di-fractor Lantern, constructed largely of light alloys and embodying a special glassbowl refractor.

Autophotometers of various types, which have fully proved their value for measurements of illu-



A view of the E.L.M.A. stand where many attractive demonstrations were arranged.

The Public Library, illuminated by eight 400 W. Sieray electric discharge lamps and Drayton floodlights. The wings of the building are floodlighted in blue and the centre in primrose.

• Look how CLEARLY and EASILY you can *SEE* . . .

THE provision of uniform illumination on the roadway, high surface brightness, and freedom from glare, whilst being excellent attributes in themselves, are not sufficient to create ideal conditions for road users at night.

The ability to be able to see **clearly** and **easily** is the ideal to be aimed at. This ideal has been achieved in Manchester Road, Bury, by means of 68 REVO C.9685 Silvered Mirror reflector Fittings, mounted 25 ft. high on span wires, at intervals of 114 ft. Each fitting is equipped with 150 watt Sodium Lamp.

The REVO C.9685 Fittings provide the right combination of uniform roadway illumination, high surface brightness and freedom from glare with the resultant MAXIMUM OF VISIBILITY along the roadway.

Write for Latest Catalogue of

SODIUM STREET LIGHTING EQUIPMENT

REVO ELECTRIC CO. LTD. TIPTON, STAFFS.

mination during recent years, were also included in the exhibit.

Street lighting control systems also figure largely amongst the exhibits. The system of centralised control and air raid signals dealt with in the G.E.C. exhibit, which was illustrated by the model shown at the head of the previous page, is based on the use of carrier current of

The new Holophane "Halo" fitting for general lighting in situations where wide distribution is required.

musical frequencies, which are superimposed over the supply network. Pilot wires are, therefore, not required. A variable speed motor-alternator set at the sub-station provides the range of frequencies utilised to operate tuned relays at selected points (e.g., from 200 to 800 cycles per sec.). Besides its primary application for controlling street lamps and giving warnings in emergency, the system can be used for other purposes, such as the control of water-heaters or services for which low rates for electricity are allowed during off-peak periods.

On their stand at the Exhibition the Standard Telephones and Cables, Ltd., displayed a representative selection of their selenium rectifiers and rectifier sets. A display on a larger scale was staged at the Scala Hall, where a complete remote control system of street lighting was on view. It could be demonstrated how push-buttons could operate air raid syrens, warning call bells, etc., as well as controlling accessory services (water heaters, etc.). Apparatus for the remote control of sub-stations, illustrated by complete diagrams, was also on view, and likewise the "transcient recorder"—an apparatus for the automatic recording or visual examination of high speed transcient-phenomena such as are encountered in surge-testing of transformers, breakdown tests on cables, etc. Other exhibits dealt with the use of condensers for eliminating power factor correction and the suppression of radio-interference, the Gamewell fire alarm system, and a model of the Southgate factory of the firm.

Another system of control, which enables equipment to be automatically put in action or cut out as daylight ceases or returns—that of Radiovisor Parent, Ltd.—also attracted interest. As our readers are aware, the Radiovisor system is based on the use of a light-sensitive bridge by means of which public street lamps, road traffic signs, luminous signs, factory lighting, etc., can be automatically switched on when the daylight is reduced to a certain value. The system will thus come into action whenever there is an unexpected fog or temporary diminution in daylight to a point where artificial light is advantageous.

Of special interest at the present moment is its application to the control of bollards and street refuges, the lighting of which is regarded as obligatory and which local authorities must satisfy. In the event of any defect arising in the circuit of the unit the lighting is automatically switched on and remains on. Numerous other special applications of the Radiovisor system were illustrated in literature available, amongst which one might select for special mention the industrial smoke indicator, by means of which imperfect combustion is quickly indicated, and the smoke alarm equipment which can be fitted in duplicate to a series of points whence fires might possibly originate. Some other uses for the equipment are as a burglar alarm, for traffic counting, paper registration, race timing, etc. In all cases the principle is the same—the interruption by some solid body of a beam of invisible light falling on a light-sensitive cell gives an appropriate indication or warning.

A Neat Form of Ceiling Switch

We illustrate herewith a neat form of "Effesca" ceiling switch recently introduced by Messrs. Falk, Stadelmann and Company, Ltd., which is of somewhat special construction. Points of interest are the quick make and break, positive action, the shock-proof cover and heavily insulated closer, and the simplicity and robustness of the mechanism. The type illustrated is of the semi-recessed pattern, "walnut" on white.

Old Cromptonians' Annual Dinner

A pleasant incident on May 20 was the annual dinner of the Old Cromptonians, at the Trocadero Restaurant, marking the sixtieth anniversary of the foundation of the original company of R. E. Crompton and Company, Chelmsford. Colonel R. E. Crompton himself, who has now reached the ripe age of ninety-three years, was present, and spoke with vigour. Lt.-Col. Kenelm Edgcumbe, when proposing "The Company," recalled early experiences as a pupil at Chelmsford. Mr. Frank Parkinson, in his response, advised all present to keep open an evening in 1978 in order to celebrate the centenary of Crompton Parkinson, Ltd.!

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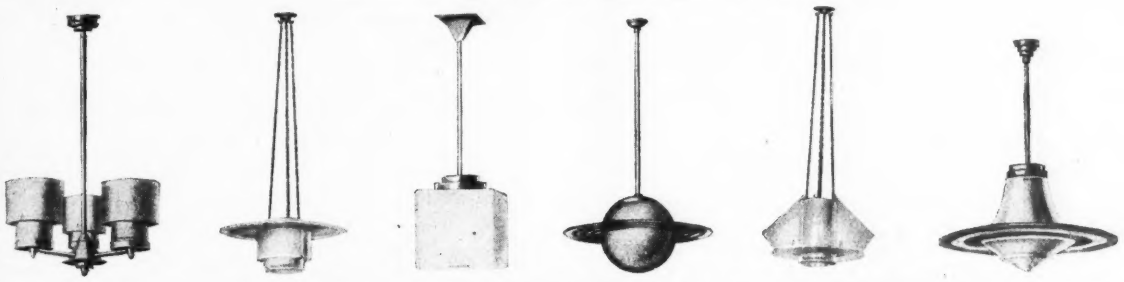
Examples taken from Catalogue S17/6.



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Public Lighting With Gas

The Knaresborough Urban District Council has entered into a tenyear agreement for gas lighting in the streets under its control. Various improvements in the lighting, which at present is carried out by 277 lamps (213 of these have three or more mantles), are to be carried out.

A seven-year contract entered into by the St. Neots U.D.C. provides for gas lighting in the streets of St. Neots and Eynesbury.

Cosely is to have improved lighting as a result of a three-year agreement for public lighting by gas. About 473 lamps are covered by the contract.

The Ormskirk U.D.C. has entered into a fifteen-year contract for gas lighting on two main roads in the district. The lamps to be installed are of a modern type, some with twelve and some with eight mantles, and will be mounted at a height of 25 ft. with a 6 ft. overhang from the kerb. This is the third fifteen-year agreement for gas lighting made by the Council under its lighting improvement scheme which was started in October, 1936. Under the three contracts a total of eighty-four gas lamps has been installed for the lighting of main roads and busy traffic routes. An increase of nearly two and a half million cubic feet of gas will be used on Ormskirk's improved lighting under the three contracts.

During 1937 87,206,859 cubic feet of gas were used for lighting the streets of Leicester at a cost of £11,511. The number of lamps in use is 5,496.

Gas Lighting for the North Circular Road

Part of the North Circular Road in the Tottenham district lighted by 6-light gas lamps, fitted with reflectors and stainless steel wing reflectors, on concrete columns. This is a typical example of a dual carriageway installation where the visibility is said to be exceptionally good.

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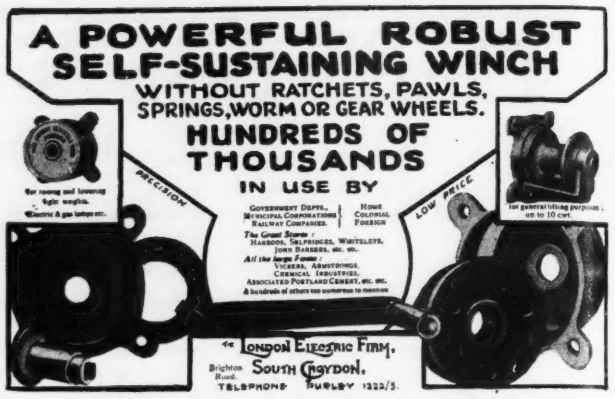

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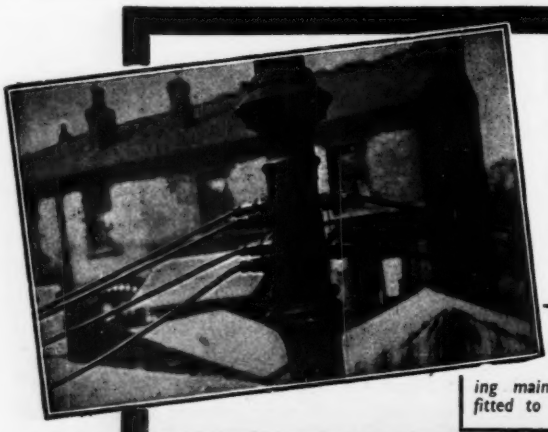

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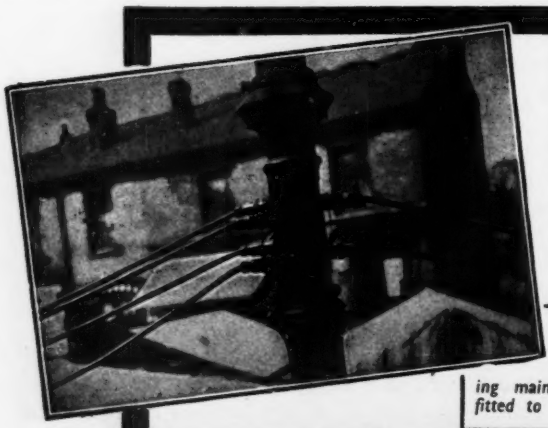

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Electric Street Lighting

Aberdeen.—Owing to its northern latitude Aberdeen can dispense with street lighting from June 1 to July 15. The Council has, however, decided to maintain full lighting until 11.30 p.m. throughout the year, except during this period.

Colchester.—The Committee has recommended that the lighting of Crouch-street and London, Military, Mile End, and Bergholt roads should be improved at a cost of £4,132.

Finchley.—After prolonged discussion it has been decided to install mercury discharge lighting on the Great North Road, in view of possible colour-correction in the future. The M.O.T. is to be asked to sanction a loan of £4,000. Two hundred and seventeen lamps, costing £4,896, are involved.

Folkestone.—Electric discharge lamps are to be provided in a number of roads, forming part of extensive street lighting improvements.

Hammersmith.—It is proposed to provide improved street lighting at a cost of £14,154. Completion of the scheme will result in all main roads in the borough being lighted by mercury discharge lamps in accordance with the M.O.T. Final report.

Jarrow-on-Tyne.—The Council has received consent from the M.O.T. for raising a loan of £1,400 for street lighting in York-avenue.

St. Pancras.—Lighting by discharge lamps, similar to that adopted for Euston-road, is to be used in the adjacent Hampstead-road. 125 watt and 250 watt mercury lamps are also to be used to light Crogsland-road, Gloucester-road, and Regent's Park-road.

Worcester.—£9,500 is to be expended on a ripple control system for controlling street lighting from a central point. It is estimated that, in addition to its value in time of emergency, the system will effect an annual saving of £850.

Falk, Stadelmann Pension Scheme

As foreshadowed by the Chairman in his speech at last year's general meeting, Falk, Stadelmann and Co., Ltd., have introduced, through the Prudential Assurance Company, Ltd., a life assurance and pension scheme, applicable to the staff of the office and warehouse of the parent company and its subsidiaries.

Modern Lighting for a Buffet

We give below a picture of a typical modern installation—the lighting from the ceiling of the Buffet in the North Suite of the Victoria Hall (London) of the Liverpool Victoria Friendly Society. Illumination

is provided by four Siemens 16-light trough pendant fittings each 10 ft. long, 2 ft. 6 in. wide, and 6 in. deep. The fittings are finished white enamel inside with satin finished panels tinted in deep amber. Siemens 75-watt gasfilled lamps are used in each of the fittings.

Contracts Closed

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LIMITED.—*Air Ministry, H.M. Office of Works,* the *Post Office,* and the *London County Council;* for the supply of various types of Siemens Electric Lamps over a period of twelve months.

Gas Lighting in Davyhulme

The main road illustrated is lighted by 12-mantle gas lamps in staggered formation, in accordance with a five-year contract, entered into by the Urmston U.D.C. with the Stretford and District Gas Board. The roadways, cycle tracks, grass verge, and footpaths are all well illuminated, and clearly defined.